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NASA CR- 144805

SOIL-MOISTURE GROUND TRUTH

HAND COUNTY, SOUTH DAKOTA
June 22, 1976, Mission

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TRUTH, HAND COUNTY, SOUTH DAKOTA Mission
Report, 22 Jun. 1976 (Bittinger (M. W.) and
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July 1976
Mission Report--June 22, 1976, Mission

Prepared for:

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SOIL-MOISTURE GROUND TRUTH
HAND COUNTY, SOUTH DAKOTA
June 22, 1976, Mission

INTRODUCTION

This report contains the ground-truth data taken at the Hand County, South Dakota, soil-moisture study site on June 22, 1976. The general location of this site is shown in Figure 1. These data were taken by M. W. Bittinger & Associates, Inc., personnel with assistance from Tom Schmugge, NASA-GSFC.

HAND COUNTY, SOUTH DAKOTA, SITE

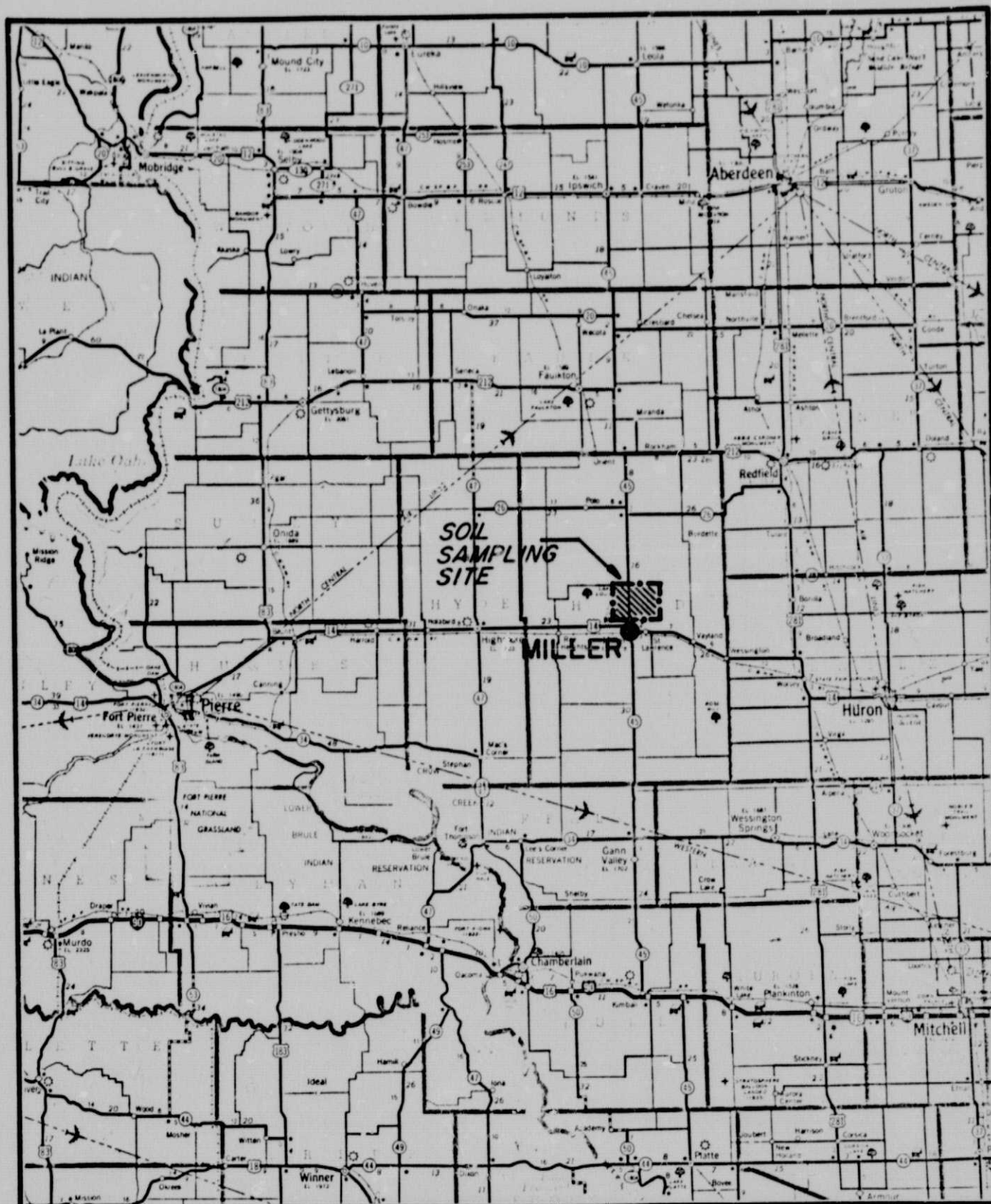
The detailed location of the Hand County site is shown in Figure 2. Figure 3 shows the field numbering system used by NASA for this study site. The lines sampled for soil moisture during this mission are also shown in Figure 2. For the sake of clarity the lines have been indicated as "North," "Middle" and "South." It will be noted that these lines are not continuous in some cases but are line segments. These lines were established after a joint field review of cropping patterns and topography. These lines are the same as those previously established and used in the April 27, 1976, mission. (Jones 1976)

Soil samples were taken in the field and carefully preserved in taped metal containers for later laboratory gravimetric analysis to determine soil-moisture content. The typical sampling pattern used in this mission is illustrated in Figure 4. The sampling pattern used for this mission was considerably reduced from the April 27th mission due to the apparent consistency of the very dry soil conditions. Samples were again taken for three depths at each sampling point--0 to 1 inch, 0 to 2 inches, and 0 to 4 inches.

SOIL-MOISTURE DATA

Soil types were determined from the Soil Survey of Hand County, South Dakota (White, Westin and Buntley 1963). The soil types encountered on the soil-moisture lines (Figure 2) are summarized in Table 1.

The actual soil-moisture data are presented in Tables 2 through 14. The data have been divided by range, township and section. Tables 15 and 16 briefly summarize the soil-moisture data obtained in fields of winter wheat and spring wheat.



0 5 10 20
SCALE (in miles)

Figure 1. Site Location
Hand County, South Dakota

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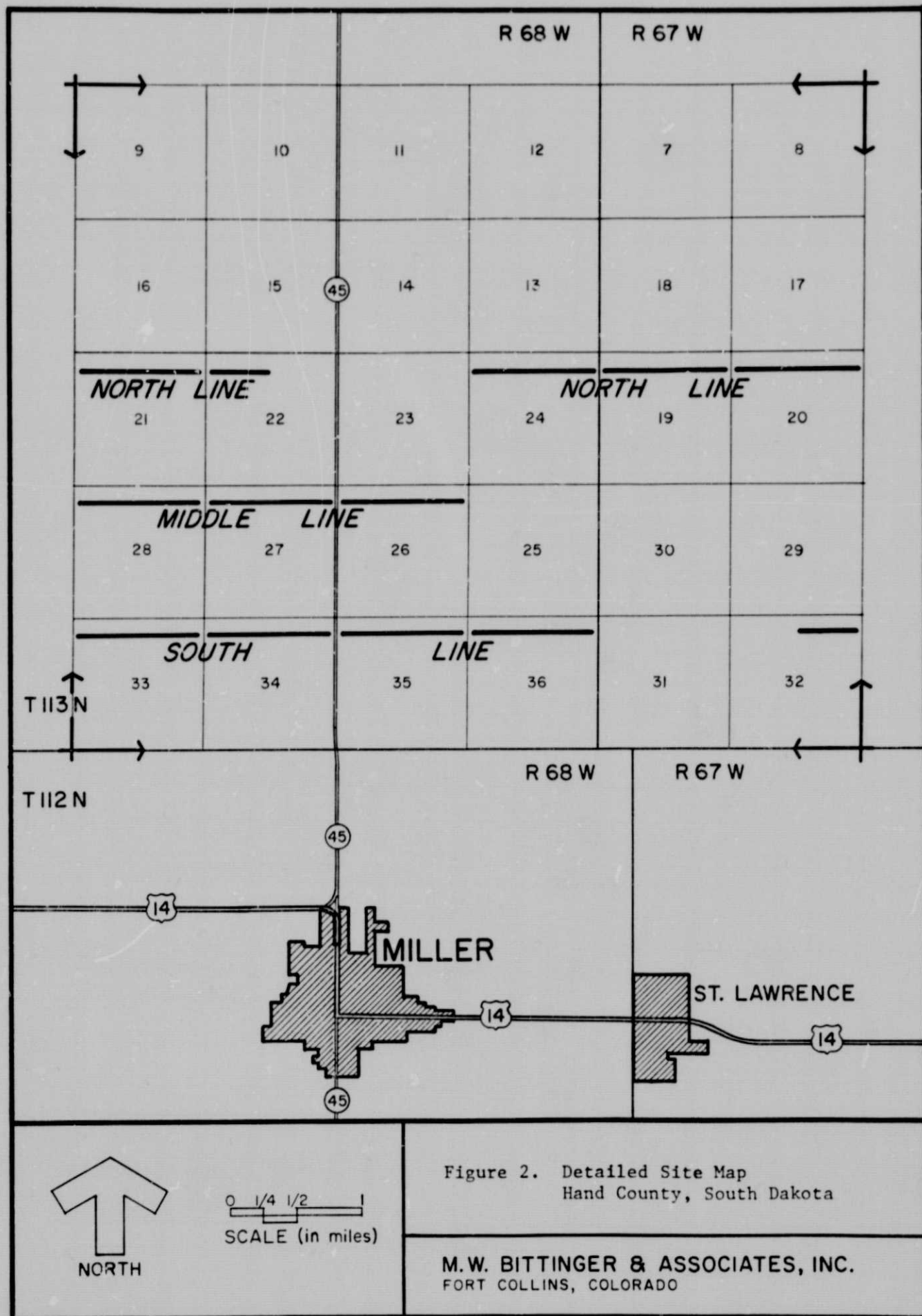
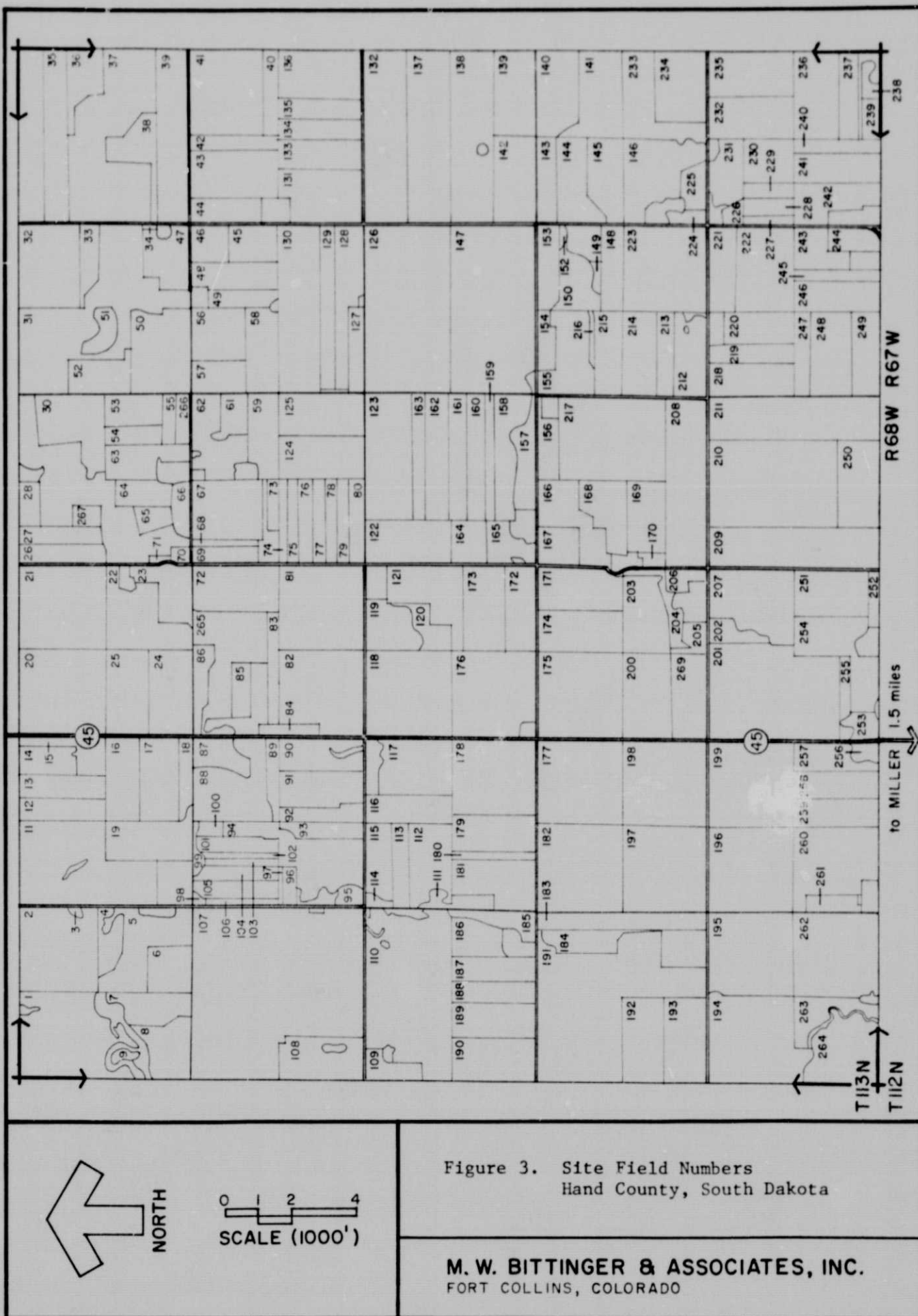
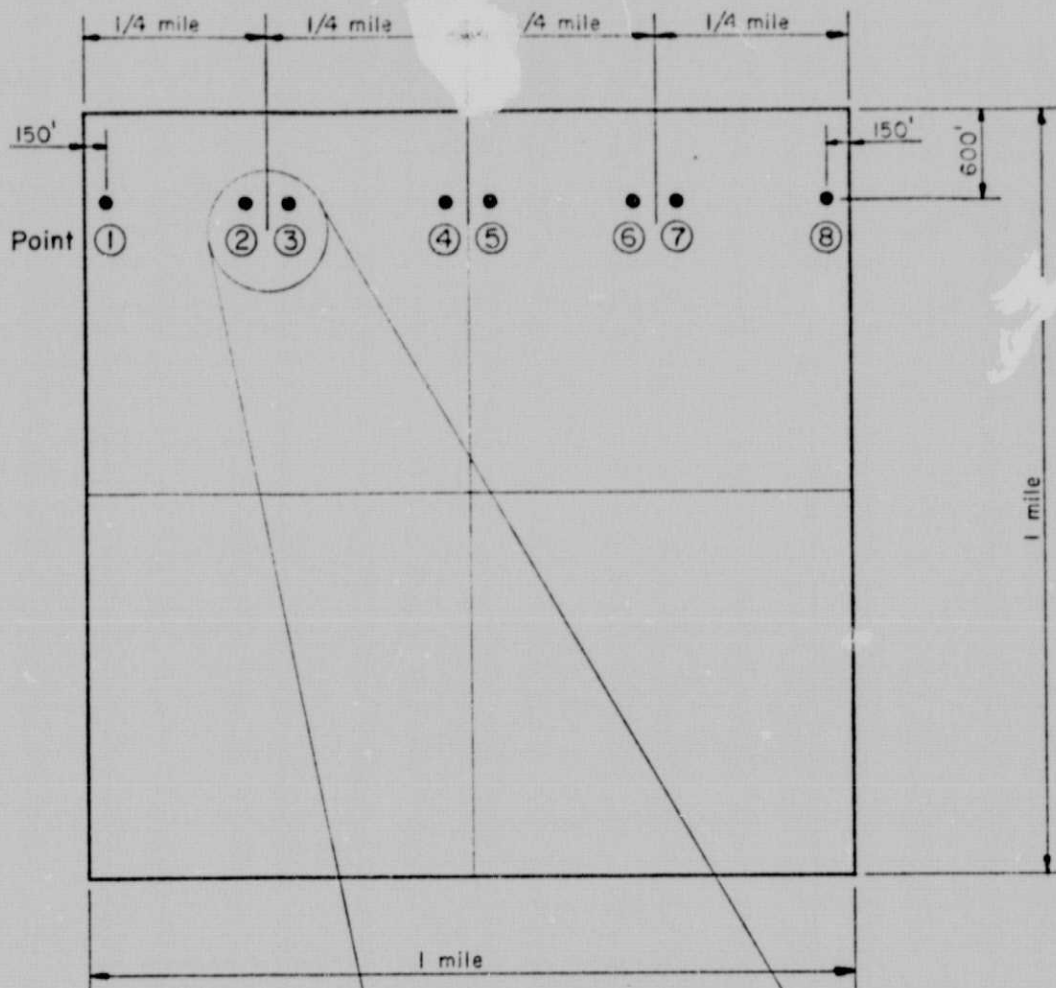


Figure 2. Detailed Site Map
Hand County, South Dakota

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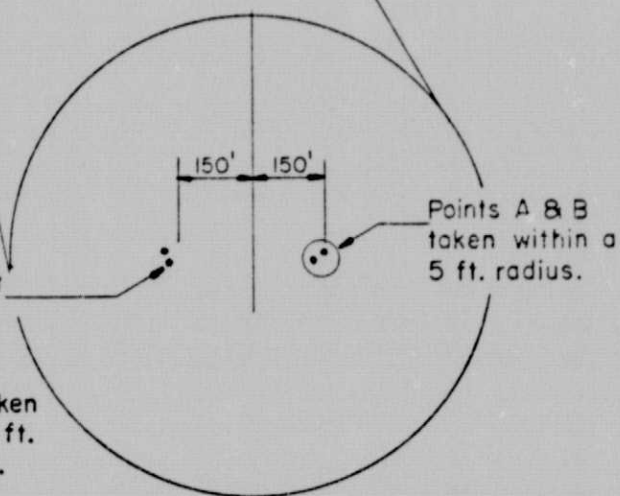




NOTE: Emphasis was placed on Points 1, 4, 5 & 8 for this mission.

The other points were sampled only as field boundaries and special conditions warranted.

Each Point
0-1"
0-2"
0-4"
sample taken within a 1 ft. dia. circle.



SCALE VARIES

Figure 4. Typical Sampling Pattern
Hand County, South Dakota
June 22, 1976, Mission

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Table 1

Soil Legend^{1/}

BcA - Bonilla-Cresbard loam, nearly level
ChA - Cavour-Houdek loams, nearly level
HhB - Houdek loam - undulating
HkA - Houdek-Bonilla loams, nearly level
HkB - Houdek-Bonilla loams, undulating
HlA - Houdek-Cavour loams, nearly level
HlB - Houdek-Cavour loams, undulating
HuD - Houdek-Zahl loams rolling
LbA - LaDelle silt loam, nearly level
LeA - LaDelle-Aberdeen silty clay loams, nearly level
LlA - LaDelle-Lamoure silt loams, nearly level
MhA - Miranda-Houdek complex nearly level
Tw - Tetonka silt loam, somewhat poorly drained

^{1/}Ref: White, E. M., Westin, F. C. and G. J. Buntley, 1963.

Table 2

Soil Moisture MissionsJune 22, 1976Hand County, South Dakota SiteData from North Line, Sec. 21 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	109	HhB	0-1	436	2.2	Plowed-out pasture
			0-2	356	2.6	Much organic
			0-4	228	5.5	
1B	109	HhB	0-1	441	2.2	Plowed-out pasture
			0-2	222	3.6	
			0-4	225	6.9	
4A	110	H1B	0-1	597	1.5	2-ft.-high winter wheat,
			0-2	468	2.0	beginning to turn color
			0-4	487	3.6	
4B	110	H1B	0-1	447	2.0	2-ft.-high winter wheat
			0-2	461	3.1	
			0-4	231	3.9	
5A	110	HkB	0-1	234	2.2	2-ft.-high winter wheat,
			0-2	217	2.0	somewhat greener than
			0-4	595	5.5	21-4
5B	110	HkB	0-1	350	1.9	1-1/2-ft.-high winter
			0-2	437	2.5	wheat, riper than 21-5A
			0-4	252	4.4	
8A	110	HkB	0-1	499	1.5	1-1/2-ft. winter wheat,
			0-2	359	2.0	hillside just above small
			0-4	429	2.3	draw
8B	110	HkB	0-1	444	4.0	2-1/2-ft. winter wheat,
			0-2	496	4.7	bottom of small draw,
			0-4	498	7.8	greener & better wheat than 21-8A

Table 3

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from North Line, Sec. 22 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	115	HkB	0-1	431	1.8	6-8" oats, very dry and beginning to burn. Extremely dry and hard at bottom.
			0-2	465	3.1	
			0-4	420	5.1	
1B	115	HkB	0-1	249	2.1	6-8" oats, very dry, starting to burn.
			0-2	246	3.1	
			0-4	477	4.9	
4A	115	HkA	0-1	611	2.3	6-8" oats, very dry, starting to burn.
			0-2	403	2.4	
			0-4	492	5.6	
4B	115	HkA	0-1	610	1.9	6-8" very dry oats, starting to burn.
			0-2	414	2.3	
			0-4	500	5.0	

Table 4
Soil Moisture Mission
June 22, 1976
Hand County, South Dakota Site
Data from North Line, Sec. 24 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	122	MhA/ChA	0-1	430	1.8	Native pasture, brown and dry
			0-2	579	5.2	
			0-4	585	7.2	
1E	122	MhA/ChA	0-1	362	3.8	Native pasture, brown and dry
			0-2	401	2.7	
			0-4	491	8.1	
4A	123	ChA	0-1	604	1.4	10-12" spring wheat, still green but burned at bottom.
			0-2	588	2.3	
			0-4	329	3.4	
4E	123	ChA	0-1	601	1.3	10-12" wheat, still green but burned at bottom.
			0-2	591	2.1	
			0-4	592	3.1	
5A	123	ChA	0-1	331	1.7	12-14" spring wheat, still green but start- ing to burn
			0-2	410	1.9	
			0-4	344	3.2	
5B	123	ChA	0-1	489	1.9	12-14" spring wheat, still green but start- ing to burn.
			0-2	424	1.7	
			0-4	578	3.7	
8A	123	Tw	0-1	925	1.5	12-14" spring wheat, mostly green, some burning at bottom, better than 24-4 & 24-5.
			0-2	918	4.4	
			0-4	400	4.7	
CB	123	Tw	0-1	765	3.8	12-14" spring wheat, mostly green, some burn- ing at bottom.
			0-2	788	4.2	
			0-4	781	4.2	

Table 5
Soil Moisture Mission
June 22, 1976
Hand County, South Dakota Site
Data from North Line, Sec. 19 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	126	ChA	0-1	913	1.6	10-12" spring wheat on newly broken pasture, wild oats and various weeds also present, organic matter all layers.
			0-2	327	2.5	
			0-4	930	3.8	
1B	126	ChA	0-1	369	1.4	Same as 1A
			0-2	916	2.1	
			0-4	402	3.2	
4A	126	ChA	0-1	705	1.4	6-8" spring wheat, quite thin, fairly ripe, quite weedy.
			0-2	325	1.5	
			0-4	773	3.7	
4B	126	ChA	0-1	932	1.5	Same as 4A
			0-2	904	2.2	
			0-4	914	2.1	
5A	126	ChA	0-1	708	1.5	6-8" spring wheat, very thin and weedy, starting to burn.
			0-2	716	2.5	
			0-4	261	4.1	
5B	126	ChA	0-1	421	1.5	Same as 5A
			0-2	931	2.0	
			0-4	774	6.2	
8A	126	ChA	0-1	761	6.4*	Mainly dried cheat grass, some 6-8" spring wheat and weeds, much organic matter.
			0-2	815	8.1*	
			0-4	715	11.1*	
8B	126	ChA	0-1	714	1.5*	Almost all dried cheat grass, very little spring wheat, much organic matter.
			0-2	811	11.4*	
			0-4	697	9.8*	

* High values attributed to organic material in sample.

Table 6

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from North Line, Sec. 20 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil 1in</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	132	ChA	0-1	687	2.8	Very thin 6-8" spring wheat, starting to burn, some weeds.
			0-2	696	4.1	
			0-4	689	5.0	
1B	132	ChA	0-1	807	2.3	Same as 1A above
			0-2	816	3.2	
			0-4	809	6.5	
4A	132	H1A	0-1	555	1.8	6-8" spring wheat, thin and very dry, still green but starting to burn.
			0-2	706	4.9	
			0-4	563	6.7	
4B	132	H1A	0-1	686	2.0	Like 4A above only wheat is thinner.
			0-2	766	2.8	
			0-4	711	3.7	
5A	132	H1A	0-1	784	2.6	Extremely thin 6-8" spring wheat, beginning to burn badly.
			0-2	789	2.4	
			0-4	790	5.3	
5B	132	H1A	0-1	743	1.5	Like 5A above except wheat is a little taller.
			0-2	771	2.7	
			0-4	671	6.1	
8A	132	Tw	0-1	660	1.8	4-6" spring wheat, very thin and burning badly, some weeds.
			0-2	673	2.7	
			0-4	649	6.0	
8B	132	Tw	0-1	651	1.4	Same as 8A above
			0-2	814	2.9	
			0-4	674	5.7	

Table 7

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 28 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	191	HkB	0-1	26	2.9	Pasture grass, very dry
			0-2	23	3.2	
			0-4	34	4.6	
1B	191	HkB	0-1	4	2.5	Pasture grass, very dry
			0-2	11	3.8	
			0-4	12	5.4	
4A	191	HuD	0-1	13	3.4	Pasture grass, dry
			0-2	21	3.4	
			0-4	27	4.6	
4B	191	HuD	0-1	5	3.0	
			0-2	10	5.9	
			0-4	33	3.7	
5A	191	HuD	0-1	35	2.8	
			0-2	36	3.6	
			0-4	41	4.6	
5B	191	HuD	0-1	40	3.2	Dried out pasture grass
			0-2	47	3.5	
			0-4	48	4.6	

Table 8

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 27 Range 68W Township 113N.

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	182	HkB	0-1	37	1.5	Soil temp. 98°F (Av. over 4")
			0-2	42	2.1	
			0-4	46	3.2	
1B	182	HkB	0-1	19	1.5	Winter wheat ripening, 24" high
			0-2	28	1.8	
			0-4	32	4.7	
4A	182	HkA	0-1	18	1.3	Winter wheat, dry, 15" high, some patches greener and taller.
			0-2	29	1.9	
			0-4	30	3.5	
4B	182	HkA	0-1	39	1.3	
			0-2	43	1.8	
			0-4	45	1.9	
5A	177	HkA	0-1	7	1.2	0-12" sample was taken, moisture below 4".
			0-4	9	9.4	
			0-12	8	18.1	
5B	177	HkA	0-1	6	1.2	Summer fallow
			0-2	14	2.1	
			0-4	17	6.6	
8A	177	HkA	0-1	151	1.3	
			0-2	152	1.7	
			0-4	153	8.1	
8B	177	HkA	0-1	145	1.2	0-12" sample taken
			0-2	146	2.3	
			0-4	154	14.4	
			0-12	168	16.4	

Table 9

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 26 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	175	HkA	0-1	167	1.3	Winter wheat 18-24" high
			0-2	169	1.5	
			0-4	180	3.4	
1B	175	HkA	0-1	160	0.9	Winter wheat 0-9" sample taken
			0-2	161	1.8	
			0-4	176	3.3	
			0-9	159	5.0	
4A	175	ChA	0-1	170	1.1	Winter wheat 18-24"
			0-2	175	1.7	
			0-4	179	3.3	
4B	175	ChA	0-1	147	1.0	
			0-2	150	1.3	
			0-4	162	3.1	
5A	174	ChA	0-1	148	1.1	Alfalfa poor condition, some apparent frost damage, 4-5" high.
			0-2	164	1.5	
			0-4	165	3.2	
5B	174	ChA	0-1	149	0.9	
			0-2	156	1.9	
			0-4	157	3.5	
6A	174	LbA	0-1	111	m*	Alfalfa, frost damaged
			0-2	112	1.5	
			0-4	122	4.7	
6B	174	LbA	0-1	114	1.6	
			0-2	117	2.7	
			0-4	119	5.1	
7A	171	LbA	0-1	130	1.4	Recently mown alfalfa, no new growth
			0-2	133	2.4	
			0-4	141	7.0	
7B	171	LbA	0-1	109	1.2	
			0-2	118	2.1	
			0-4	143	5.6	

* Label error--sample treated as missing.

Table 9 (continued)

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 26 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
8A	171	LeA	0-1	127	1.6	
			0-2	138	2.4	
			0-4	142	6.1	
8B	171	LeA	0-1	125	2.8	
			0-2	129	2.3	
			0-4	134	6.4	

Table 10

Soil Moisture MissionJune 22, 1976Hank County, South Dakota SiteData from South Line, Sec. 33 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	194	HkB	0-1	1250	3.1	Pasture - native grass, highly organic.
			0-2	1254	4.3	
			0-4	1255	4.7	
1B	194	HkB	0-1	1253	3.1	Pasture - native grass, highly organic.
			0-2	1251	5.1	
			0-4	1249	5.7	
4A	194	HuD	0-1	1242	2.0	Pasture - native grass, highly organic.
			0-2	1247	2.7	
			0-4	1258	3.5	
4B	194	HuD	0-1	1240	2.6	Pasture - native grass, highly organic.
			0-2	1244	3.1	
			0-4	1248	3.1	
5A	195	HkB	0-1	1256	1.6	Winter wheat near maturity
			0-2	1243	2.2	
			0-4	1260	2.8	
5B	195	HkB	0-1	1257	1.8	Winter wheat near maturity
			0-2	1259	2.5	
			0-4	1252	2.5	
8A	195	HkB	0-1	1226	1.8	Winter wheat near maturity.
			0-2	1225	1.9	
			0-4	1236	2.4	
8B	195	HkB	0-1	1227	1.9	Winter wheat near maturity
			0-2	1241	2.9	
			0-4	1233	4.2	

Table 11
Soil Moisture Mission
June 22, 1976
Hand County, South Dakota Site
Data from South Line, Sec. 34 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	196	HkB	0-1	1245	2.5	Winter wheat, near maturity
			0-2	1232	2.6	
			0-4	1228	2.7	
1B	196	HkB	0-1	1237	1.8	Winter wheat, near maturity
			0-2	1246	1.9	
			0-4	1239	2.3	
4A	196	HkB	0-1	1230	1.9	Winter wheat, near maturity
			0-2	1234	2.9	
			0-4	1238	5.2	
4B	196	HkB	0-1	1229	1.6	Winter wheat, near maturity
			0-2	1231	2.4	
			0-4	1235	3.5	
5A	199	HkB	0-1	1287	1.5	Spring wheat (?), poor stand, organic
			0-2	1285	1.7	
			0-4	1293	2.2	
5B	199	HkB	0-1	1292	1.2	Spring wheat (?), poor stand
			0-2	1288	1.8	
			0-4	1286	2.5	
8A	199	HkB	0-1	1276	1.3	Spring wheat (?), poor stand
			0-2	1271	1.9	
			0-4	1269	2.7	
8B	199	HkB	0-1	1266	1.2	Spring wheat (?), poor stand, high in organics.
			0-2	1265	1.6	
			0-4	1270	2.9	

Table 12

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from South Line, Sec. 35 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	201	HkB	0-1	1267	1.2	Disced stubble, summer fallow
			0-2	1261	3.8	
			0-4	1273	5.3	
1B	201	HkB	0-1	1268	1.5	Disced stubble, summer fallow
			0-2	1272	3.2	
			0-4	1262	5.5	
4A	201	BhA	0-1	1282	2.1	Disced stubble, summer fallow; special sample 6-8", soil below worked depth.
			0-2	1274	3.4	
			0-4	1280	3.7	
			6-8	1283	17.2	
4B	201	BhA	0-1	1277	1.5	Disced stubble, summer fallow
			0-2	1263	2.4	
			0-4	1296	5.1	
5A	202	Tw	0-1	1291	1.5	Disced stubble, summer fallow
			0-2	1264	2.9	
			0-4	1275	5.6	
5B	202	Tw	0-1	1295	2.4	Disced stubble, summer fallow
			0-2	1278	3.9	
			0-4	1289	4.9	
8A	207	BcA	0-1	1279	1.3	Disced stubble, summer fallow (appears to be recent)
			0-2	1290	2.3	
			0-4	1284	3.1	
8B	207	BcA	0-1	1294	1.6	Same as 8A above
			0-2	1281	2.7	
			0-4	1326	2.9	Hard pan
			10-12	1330	6.3	

Table 13

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from South Line, Sec. 36 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	209	BcA	0-1	1323	0.9	Spring wheat
			0-2	1322	1.4	
			0-4	1329	3.6	
			8-10	1321	7.4	
1B	209	BcA	0-1	1328	1.0	Spring wheat
			0-2	1327	2.7	
			0-4	1324	4.8	
4A	210	BcA	0-1	1310	3.1	Winter wheat
			0-2	1318	2.7	
			0-4	1319	4.2	
4B	210	BcA	0-1	1312	0.8	Winter wheat
			0-2	1314	2.2	
			0-4	1309	5.1	
5A	210	BcA	0-1	1313	1.0	Winter wheat
			0-2	1331	2.6	
			0-4	1311	4.1	
5B	210	BcA	0-1	1317	1.1	Winter wheat
			0-2	1332	1.9	
			0-4	1325	3.5	
8A	211	BcA	0-1	1304	1.2	Grass pasture
			0-2	1301	2.4	
			0-4	1315	5.3	
8B	211	BcA	0-1	1320	1.0	Grass pasture
			0-2	1300	2.8	
			0-4	1308	3.9	

Table 14

Soil Moisture MissionJune 22, 1976Hand County, South Dakota SiteData from South Line, Sec. 32 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
6A	232	HkA	0-1	1307	0.7	Scrawny corn
			0-2	1316	2.3	
			0-4	1303	6.3	
6B	232	HkA	0-1	1299	1.5	Scrawny corn
			0-2	1297	2.8	
			0-4	1298	4.7	
			6-9	1302	16.5	Special sample
7A	235	HkA	0-1	1357	1.4	Pasture grass
			0-2	1306	2.4	
			0-4	1362	6.0	
7B	235	HkA	0-1	1305	2.1	Pasture grass
			0-2	1358	2.8	
			0-4	1361	7.5	

Table 15
Winter Wheat Soil Moisture
by Selected Fields

<u>Line</u>	<u>N</u>	<u>M</u>	<u>M</u>	<u>S</u>	<u>S</u>	<u>S</u>	<u>Weighted</u>
<u>Field</u>	<u>110</u>	<u>182</u>	<u>175</u>	<u>195</u>	<u>196</u>	<u>210</u>	<u>means</u>
0"-1"							
\bar{x}	2.2%	1.4%	1.1%	1.8%	2.0%	1.5%	1.7%
σ_x	0.9%	0.1%	0.2%	0.1%	0.4%	1.1%	-
n	6	4	4	4	4	4	26
0"-2"							
\bar{x}	2.7%	1.9%	1.6%	2.4%	2.5%	2.4%	2.3%
σ_x	1.1%	0.1%	0.2%	0.4%	0.4%	0.4%	-
n	6	4	4	4	4	4	26
0"-4"							
\bar{x}	4.6%	3.3%	3.3%	3.0%	3.7%	4.2%	3.8%
σ_x	1.9%	1.2%	0.1%	0.8%	1.1%	0.7%	-
n	6	4	4	4	4	4	26
Dominant soil type	HkB	HkB	ChA	HkB	HkB	BcA	

Table 16
Spring Wheat Soil Moisture
by Selected Fields

<u>Line</u>	<u>N</u>	<u>N</u>	<u>N</u>	<u>S</u>	<u>S</u>	<u>Weighted</u>
<u>Field</u>	<u>115^{1/}</u>	<u>123</u>	<u>132</u>	<u>199</u>	<u>209</u>	<u>means</u>
0"-1"						
\bar{x}		1.9%	2.0%	1.3%	1.0%	1.7%
σ_x		0.9%	0.5%	0.1%	0.1%	-
n		6	8	4	2	20
0"-2"						
\bar{x}		2.8%	3.2%	1.8%	2.1%	2.7%
σ_x		1.2%	0.9%	0.1%	0.9%	-
n		6	8	4	2	20
0"-4"						
\bar{x}		3.7%	5.6%	2.6%	4.2%	4.3%
σ_x		0.6%	1.0%	0.3%	0.8%	-
n		6	8	4	2	20
Dominant soil type	HkB HkA	Cha	Tw HkA H1A	HkB	BcA	

^{1/} This field was replanted to oats.

REFERENCES

- White, E. M., Westin, F. C., and Buntley, G. J., 1963, Soil Survey of Hand County, South Dakota; USDA Soil Conservation Service in cooperation with South Dakota Agricultural Experiment Station, Series 1956, No. 21, U. S. Government Printing Office, Washington, DC, 112 pp plus maps.
- Jones, E. Bruce, 1976, Soil Moisture Ground Truth, Hand County, South Dakota, April 27, 1976; Mission Report to NASA-Goddard Space Flight Center (Contract Number NAS5-22312), M. W. Bittinger & Associates, Inc., Fort Collins, Colorado, 44 pp.